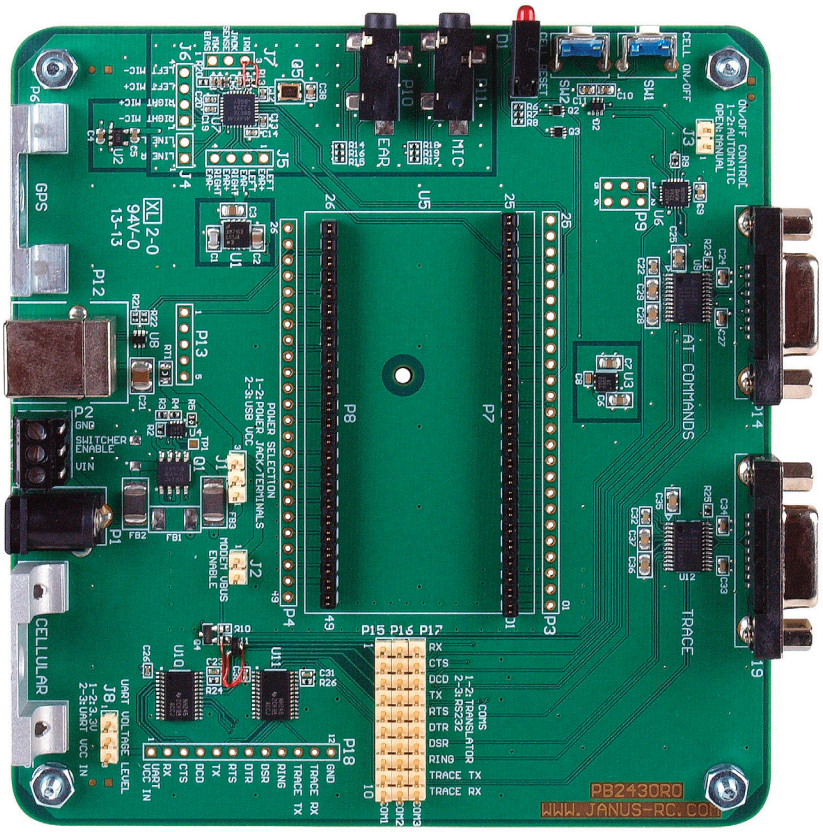
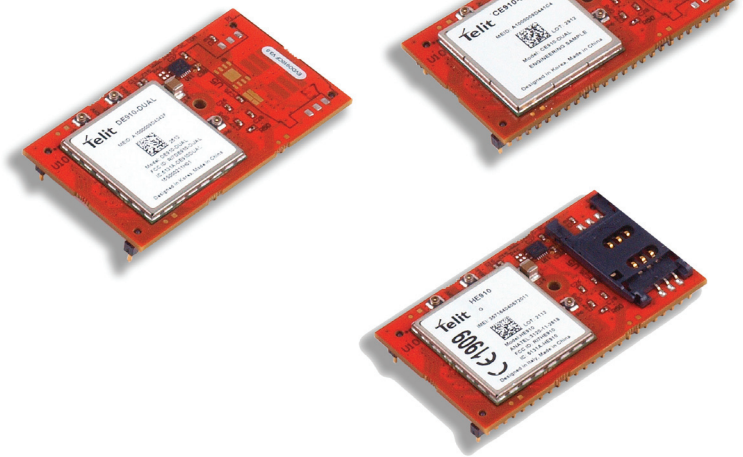
Terminus 910CF Plug-In Modules
Evaluation Kit User Guide





JANUS REMOTE COMMUNICATIONS

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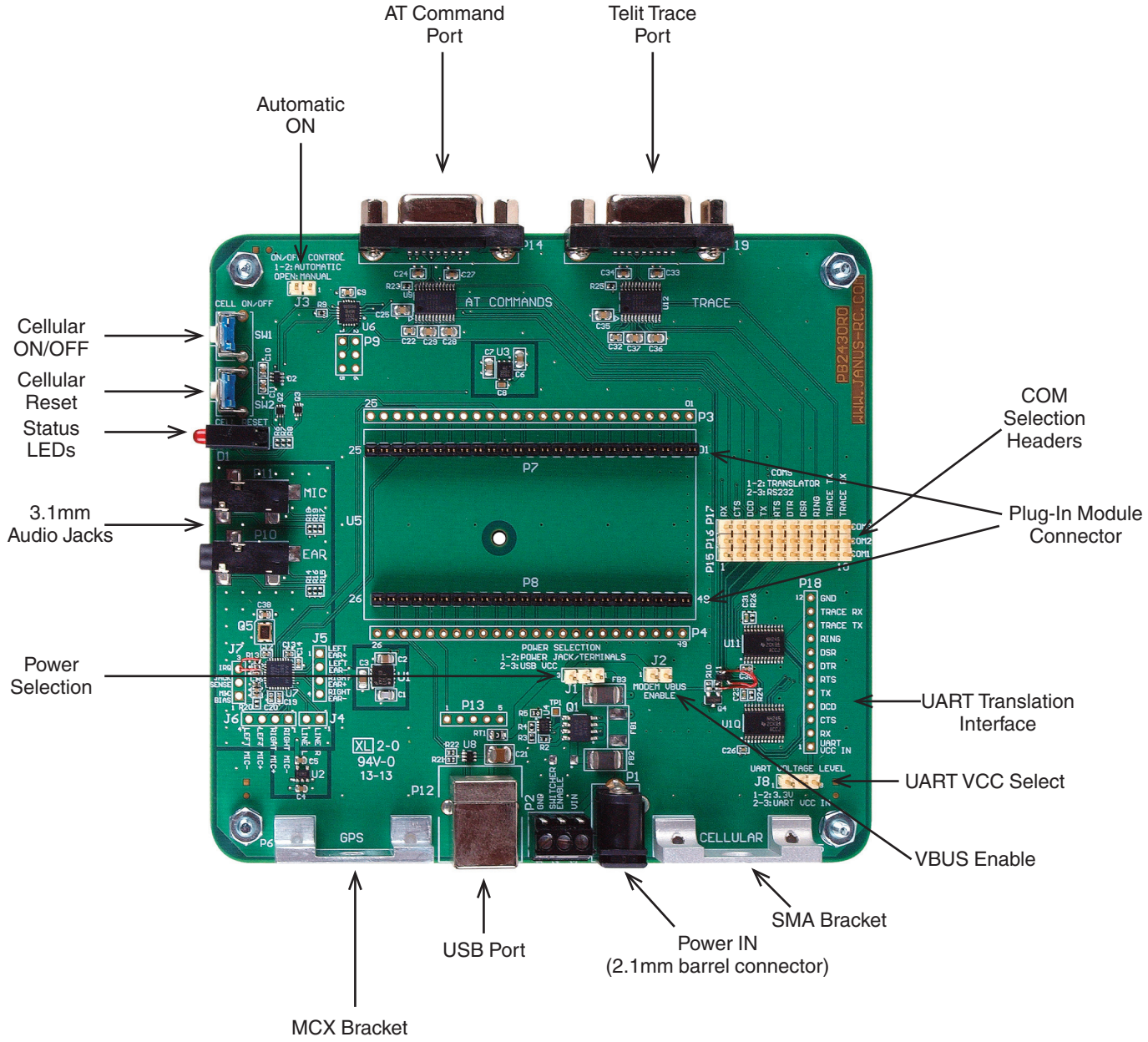
Introduction

The following document describes the functions of the evaluation board for the Terminus 910CF Plug-In series of cellular communication terminals. This guide, along with the Plug-In Modules Hardware User guide, allows all features of the terminal to be evaluated before your PCB goes into CAD.

Evaluation Kit Board Details



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Interfaces

Power Supply

The Evaluation Board requires 5VDC to power the evaluation PCB and Terminus module. The evaluation board has two power supply connection options: center positive barrel connector or terminal block direct wire connection.

The Evaluation Board is equipped with protection circuitry to prevent reverse voltage, as well as help with protection from transients. The board can withstand a reverse voltage of -40V and a peak voltage of 60V. The circuitry is set to clip any input greater than 5.6V to a safe level.

Any input above 5.6V will read for a set period, and if before 2.0 uS has not returned to safe level, the over-voltage protection will activate and turn off the output.

To re-enable the output, power must be cycled or the SWITCHER_EN pin (DIP pos. 7) must be pulled low at least 3.0 µS and then released. Alternatively, if the power returns to a safe level for 36.0 mS the output will re-enable.

Power supply requirement:

Voltage: 5Vdc ± 5%
Power: 10W peak

Serial Interfaces

RS-232 Serial Ports

The Evaluation board for the Plug-In terminals has two RS-232 serial ports.

AT COMMAND PORT:

This port is available to send AT commands to the terminal. Please refer to the Terminus Plug-In User Guide for serial port details for the specific terminal you are evaluating.

Typical Port Settings:

Baud:	115200
Data bits:	8
Parity:	None
Stop Bits:	1
Hardware Handshaking:	CTS/RTS

Trace Port:

This port is used by the HSPA910CF terminal as a secondary serial AT interface. This port is not used for Python script upload. However, during development of Python scripts this port can be used to receive debug ‘print’ statements. In order to do this, AT#PORTCFG=3 should be used. Hardware handshaking is not available on this port.

Port Settings:

Baud:	115200
Data bits:	8
Parity:	None
Stop Bits:	1
Hardware Handshaking:	N/A

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Interfaces continued

Serial Interfaces continued...

UART Translator Interface:

If the user wants to communicate with the modem's serial interface via the on board UART translation, you can attach to the SIP header interface, P18. The full UART is broken out, along with TRACE TX and TRACE RX.

The translator's modem side level is referenced to VAUX, meaning it is OFF when the modem is off. This function will tri-state the signals as recommended in the Plug in Modem User Manual.

The user can select between their own input voltage level and 3.3VDC by adjusting the J8 jumper setting.

1-2: 3.3V

2-3: User VCC In

If User VCC In is used, the header position #1, labeled UART VCC IN, should be connected to the desired power supply.

Absolute Maximum Ratings

Parameters	Min	Max
Supply Voltage	-0.5v	6.5v
Input Voltage	-0.5v	VCC + 0.5v
Continuous Output Current	-	+/- 50mA

Recommended Operating Characteristics

Parameter	Supply	Min	Max
Supply Voltage		1.65v	5.5v
VIH	1.65v to 1.95v	VCC*0.65	-
	2.3v to 2.7v	1.7v	-
	3.0v to 3.6v	2.0v	-
	4.5v to 5.5v	VCC*0.7	-
VIL	1.65v to 1.95v	-	VCC*0.35
	2.3v to 2.7v	-	0.7v
	3.0v to 3.6v	-	0.8v"
	4.5v to 5.5v	-	VCC*0.3
VOH	1.65v to 1.95v	1.2v	-
	2.3v to 2.7v	1.9v	-
	3.0v to 3.6v	2.4v	-
	4.5v to 5.5v	3.8v	-
VOL	1.65v to 1.95v	-	0.45v
	2.3v to 2.7v	-	0.3v
	3.0v to 3.6v	-	0.55v
	4.5v to 5.5v	-	0.55v

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Interfaces continued

Serial Interfaces continued...

USB Serial Ports:

The development board allows access to virtual COM ports and modem ports via the USB. To use this interface during development you will need to download the USB drivers from the Janus website (www.janus-rc.com).

The HSPA910CF will show several virtual COM ports after the drivers are installed. These are USB0 through USB6, along with a modem for applications like Dial Up with Windows. This allows for applications like simultaneous AT commands, voice calls, and Python tracing.

These ports can be configured in various ways depending on the user's application, but by default USB0 and USB3 are AT command ready after enumeration.

Typical Port Settings:

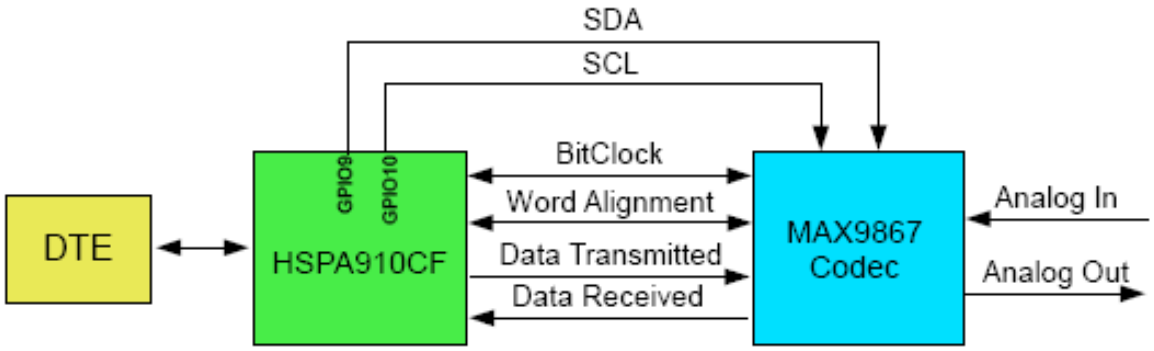
Baud: 115200
Data bits: 8
Parity: None
Stop Bits: 1
Hardware Handshaking: N/A

You will want to reference the HSPA910CF Ports Arrangements application note for full details on using the AT#PORTCFG command.

Please note that in order for proper power on sequencing, the modem must be turned on first. The USB VCC line must be disconnected until the device is on otherwise it may not power up correctly, or properly install the USB drivers. The development board already handles this power sequencing for you in both automatic turn on and manual turn on modes, but it is good to note for your implementation outside of the development kit.

Audio

The development board is equipped to take advantage of the DVI signals present on the HSPA910CF and EVDO910CF. The connection available to the user is in separate 3.5mm EAR and MIC ports. The audio uses the MAX9867 IC and is set for capacitorless differential mode. Control of the MAX IC is done via the I2C available on the modems (using GPIO 9 and GPIO 10) with the AT#I2CWR command.



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Push Button Switches

The development board has 2 push buttons to control the state of the Plug in Terminus.

Cell ON/OFF

This switch is used to toggle the modem ON or OFF. When the board is set to manual control, this signal must be used to turn the modem ON by holding the switch for 5 seconds and then releasing.

Cell RESET

This switch is used to recover operation of the Plug in Terminal in case of unexpected error resulting from the inability of the application to communicate with the terminal.

LED Indicators

The board is equipped with an LED stack with Red, Yellow, and Green LEDs.

Green – Connected to the modem's GPIO #2, adjusted with the AT#GPIO command

Green LED Status	Device Status
Permanently Off	GPIO is LOW
Permanently On	GPIO is HIGH

Yellow – Connected to the modem's GPIO #1, which doubles as the cell status indication.

Yellow LED Status	Device Status
Permanently Off	Cellular radio is off
Permanently On	On/Searching
Slow Blinking *(0.3 sec on / 2.7 sec off)*	Registered
Fast Blinking *(0.5 sec on / 0.5 sec off)*	Shutting down

Red – This LED is an indicator to show the status of VBUS, which indicates if the USB connection is active.

Red LED Status	Device Status
Permanently Off	VBUS is LOW
Permanently On	VBUS is HIGH

RF Interfaces

There are two brackets for the RF connections to the antenna. The board itself does not have an RF interface; instead it allows the user to run mini coax cables to hard points for antenna access.

CELLULAR –

This bracket is for an SMA ended cable, in our evaluation kit we include a Murata GSC to SMA connector for this purpose.

GPS –

This bracket is for an MCX ended cable, in our evaluation kit we include a Murata GSC to MCX connector for this purpose.

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Development Board Jumpers and Headers

There are several jumpers available on the board to allow maximum flexibility.

J1 Power Selection:
1-2: Power Jack/Terminals
2-3: USB VCC
This jumper controls what the board itself will be powered from, allowing the user to do power analysis of the Plug in Terminus by itself in regard to the main power input.

If the USB configuration is used, please note that only the evaluation board and a majority of its components will be powered by the USB. The attached CF module and evaluation board protection circuitry will not be and will still need to draw its power from the main “Power In” screw terminals or barrel jack. The protection circuitry will add a draw of roughly 1.0mA.

J2 Modem VBUS Enable
1-2: Enabled
Open: Disabled
This jumper controls if the VBUS signal can be attached to the Plug in Terminus. This ONLY controls the VBUS signal to the Plug in Terminus; this jumper has no effect on powering the development board from the USB connection.

J8 UART Voltage Level
1-2: 3.3V
2-3: User VCC In
This jumper controls what voltage reference is used for the on board UART translation. The user can select between a specific desired input voltage level and 3.3VDC.

If User VCC In is used, the header position #1, labeled UART VCC IN, should be connected to the desired power supply.

J3 ON/OFF CONTROL
1-2: Automatic
Open: Manual
This jumper controls if the board will automatically turn on the Plug in Terminus. The on board microcontroller will handle the power sequencing regardless of the selection; this simply allows the user to utilize the CELL ON/OFF switch to turn the unit on or off.

P15, P16, P17 COMS Header Rows
1-2: Translator
2-3: RS232
This header section is for choosing which section of the board to communicate to the modem through.

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Getting Started

This will take you through the initial steps required that will allow AT commands to be sent to the Plug in Terminus module.

USB Communications

Step 1

Please confirm that you have these items:

- Power supply with 2.1mm barrel connector termination
- 3' USB cable
- Murata GSC to SMA cable
- Murata GSC to MCX cable (Optional)
- Cellular Antenna
- GPS Antenna (Optional)
- Jumper Shunts

Step 2

Use the jumpers to set the following for basic configuration:

- J1 Power Selection – 1-2 (Power Jack)
- J2 Modem VBUS Enable – 1-2 (Enabled)
- J3 ON/OFF Control – 1-2 (Automatic)

No other jumpers are required for this, and may be left off.

Step 3

If not done already, plug the HSPA910CF Plug in Module into the connectors at the center of the Development Board, being sure to align the pins properly. Take note that to make the alignment easier, the two connectors are of different lengths.

Step 4

Cellular: Use the included GSC to SMA cable and attach the GSC end to P5 (CELL) on the HSPA910CF and the other end to the CELL bracket. Then attach the cellular antenna to the SMA connector.

GPS: Use the included GSC to MCX cable and attach the GSC end to P6 (GPS) on the HSPA910CF and the other end to the GPS bracket. Then attach the GPS antenna to the MCX connector, giving the antenna ample view of the sky

Step 5

Connect the USB cable to the USB B connector on the board; connect the other end to an available USB port on your PC.

Step 6

Plug in your power supply to the 2.1mm barrel connector on the board, labeled P1. The auto-start will turn the unit on and you should see the Yellow LED begin blinking after roughly 5 seconds. The USB connection will then activate after another 5 seconds, with an indication by the Red LED.

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USB Communications continued

Step 7

You should see the following ports in the Windows Device manager:

USB1

USB2

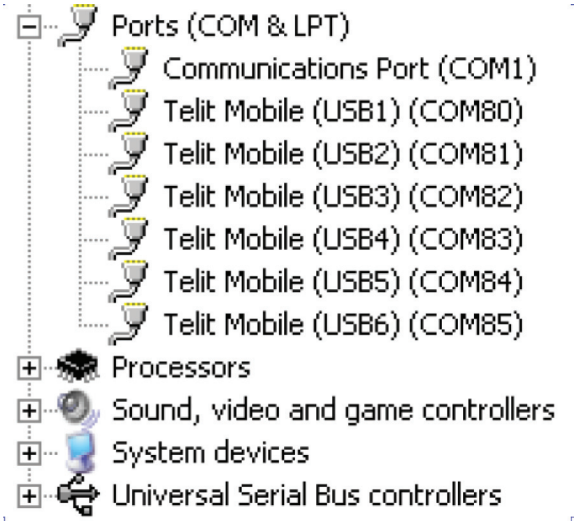
USB3

USB4

USB5

USB6

If these do not become available, or you see an error message, this means you need to install the USB drivers for the HSPA910CF. Please refer to http://www.janus-rc.com/terminuscf.html for the proper drivers before continuing.



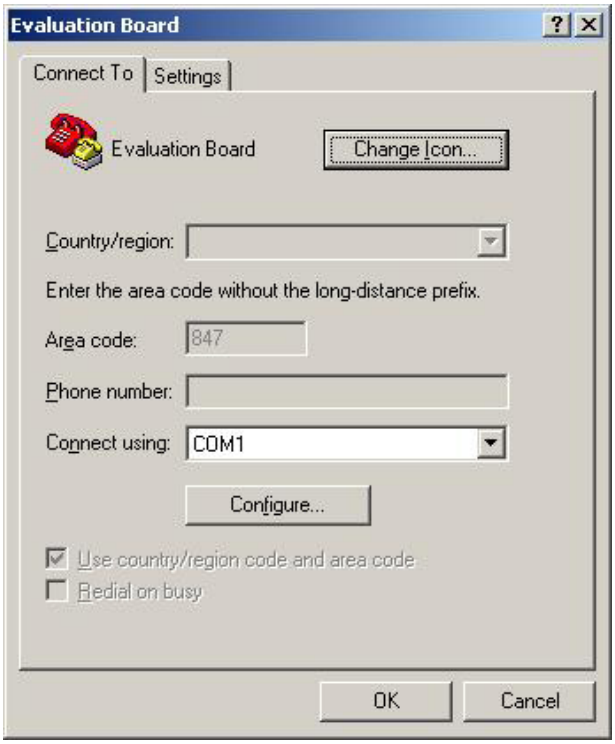
Step 8

Open HyperTerminal or a similar terminal emulator and start a new session. Use the drop down box to select the COM port that corresponds to the USB3 connection.

Then select “Configure,” and select these settings:

Bits per second:	115200
Data Bits:	8
Parity:	None
Stop Bits:	1
Flow control:	None

Then press “OK.”



Step 9

Click on the “Call” button in HyperTerminal to make the connection. In the window you should now be able to send AT commands. To make sure you have a proper connection, type “AT” into the window, and press Enter. You should receive a response of “OK”.

If you do not receive that response, go back and check to make sure you’ve selected the correct COM port, as well as the settings.

If you receive an OK, your connection is successful and you are now able to communicate with the module. Please refer to http://www.janus-rc.com/terminuscf.html for a link to further documentation.

The Terminus CF User Manual will give you step by step instructions on setting up voice and data calls, SMS messages, and socket connections. These functions are basic and easily done, but are out of the scope of this document as the steps may differ slightly between modem types.

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Getting Started continued

RS232 Serial Communication

Step 1

Please confirm that you have these items:

Power supply with 2.1mm barrel connector termination
6' RS232 cable
Murata GSC to SMA cable
Murata GSC to MCX cable (Optional)
Cellular Antenna
GPS Antenna (Optional)
Jumper Shunts

Step 2

Use the jumpers to set the following for basic configuration:
J1 Power Selection – 1-2 (Power Jack)
J3 ON/OFF Control – 1-2 (Automatic)
P15, P16, P17 COMS – 2-3 (RS-232)
No other jumpers are required for this, and may be left off.

Step 3

If not done already, plug the HSPA910CF Plug in Module into the connectors at the center of the Development Board, being sure to align the pins properly. Take note that to make the alignment easier, the two connectors are of different lengths.

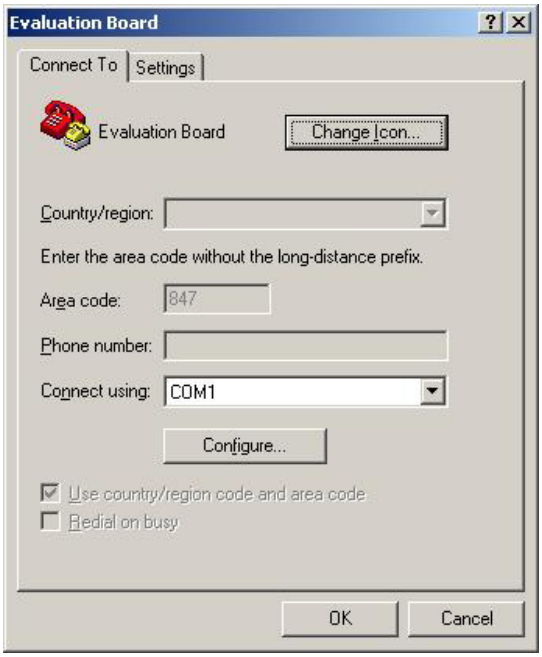
Step 4

Cellular: Use the included GSC to SMA cable and attach the GSC end to P5 (CELL) on the HSPA910CF and the other end to the CELL bracket. Then attach the cellular antenna to the SMA connector.

GPS: Use the included GSC to MCX cable and attach the GSC end to P6 (GPS) on the HSPA910CF and the other end to the GPS bracket. Then attach the GPS antenna to the MCX connector, giving the antenna ample view of the sky

Step 5

Connect the RS-232 cable to the AT COMMANDS DB9 connector on the board; connect the other end to an available serial port on your PC.



Step 6

Plug in your power supply to the 2.1mm barrel connector on the board, labeled P1. The auto-start will turn the unit on and you should see the Yellow LED begin blinking after roughly 5 seconds.

Step 7

Open HyperTerminal or a similar terminal emulator and start a new session. Use the drop down box to select the COM port that corresponds to the serial port connection.

Then select "Configure," and select these settings:

Bits per second:	115200
Data Bits:	8
Parity:	None
Stop Bits:	1
Flow control:	Hardware

Then press "OK."

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Step 8

Click on the “Call” button in HyperTerminal to make the connection. In the window you should now be able to send AT commands. To make sure you have a proper connection, type “AT” into the window, and press Enter. You should receive a response of “OK”.

If you do not receive that response, go back and check to make sure you’ve selected the correct COM port, as well as the settings.

If you receive an OK, your connection is successful and you are now able to communicate with the module. Please refer to http://www.janus-rc.com/terminuscf.html for a link to further documentation.

The Terminus CF User Manual will give you step by step instructions on setting up voice and data calls, SMS messages, and socket connections. These functions are basic and easily done, but are out of the scope of this document as the steps may differ slightly between modem types.

Audio

The audio connection can be utilized by any of the Terminus Plug in Modules that have a DVI interface. This section assumes that AT communication to the modem has been achieved.

HSPA910CF

- Enable the DVI interface and set it to master mode
  AT#DVI=1,2,1
- Set the interface type, and sample information.
  AT#DVIEXT=1,0,0,1,0
- Set the handset microphone gain.
  AT#HSMICG=2
- Disable the handset sidetone.
  AT#SHSSD=0
- Write the MAX9867 register information.
  AT#I2CWR=9,10,30,4,19
  Wait for response ”>” then enter the register information
  >00109000100A330000330C0C09092424400060
  Press CTRL+z to send the information
  Wait for response “OK”
  AT#I2CWR=9,10,30,17,1
  Wait for response ”>” then enter the register information
  >8A
  Press CTRL+z to send the information
  Wait for response “OK”
- Test the audio output by using a test tone generation.
  AT#TONE=5,10
  This will send out the DTMF tone for the #5 key press, for 1 second.

If the tone can be heard, the audio path has been set up and can now be utilized for voice calls or other purposes.

If the audio cannot be heard or is very quiet, the TSVOL command can be utilized to bring up the volume.

Example
AT#TSVOL=255,1,10

This adjusts all audio types, and a max value of 14 can be used. Please see the AT Command Reference for full command details.

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Getting Started continued

EVDO910CF

- Enable the DVI interface and set it to master mode.
  AT#DVI=1,2,1
- Set the interface type, and sample information.
  AT#DVICFG=1,1,2,1,2
- Set the handset microphone gain.
  AT#HSMICG=2
- Disable the handset sidetone.
  AT#SHSSD=0
- Write the MAX9867 register information.

With the EVDO910CF, we can't use the I2CWR command fully due to a current issue with multi-byte writing.

Example

AT#I2CWR=9,10,30,5,18 <-- This will return "OK", but won't actually work

Instead, we have to use it in single byte format if we want to use I2CWR, like below

Example

AT#I2CWR=9,10,30,5,1
Wait for response ">" then enter the register information
>10
Press CTRL+z to send the information
Wait for response "OK"

The full flow of commands is as follows:

AT#I2CWR=9,10,30,5,1
>10
AT#I2CWR=9,10,30,6,1
>10
AT#I2CWR=9,10,30,7,1
>00
AT#I2CWR=9,10,30,8,1
>74
AT#I2CWR=9,10,30,9,1
>0A
AT#I2CWR=9,10,30,A,1
>00
AT#I2CWR=9,10,30,B,1
>00
AT#I2CWR=9,10,30,C,1
>00
AT#I2CWR=9,10,30,D,1
>33
AT#I2CWR=9,10,30,E,1
>0C
AT#I2CWR=9,10,30,F,1
>0C
AT#I2CWR=9,10,30,10,1
>09
AT#I2CWR=9,10,30,11,1
>09
AT#I2CWR=9,10,30,12,1
>24
AT#I2CWR=9,10,30,13,1
>24
AT#I2CWR=9,10,30,14,1
>40
AT#I2CWR=9,10,30,15,1
>00
AT#I2CWR=9,10,30,16,1
>60
AT#I2CWR=9,10,30,17,1
>8A

- Test the audio output by using a test tone generation.
  AT#TONE=5,10
  This will send out the DTMF tone for the #5 key press, for 1 second.

If the tone can be heard, the audio path has been set up and can now be utilized for voice calls or other purposes.
If the audio cannot be heard or is very quiet, the TSVOL command can be utilized to bring up the volume.

Example
AT#TSVOL=255,1,10

This adjusts all audio types, and a max value of 14 can be used. Please see the AT Command Reference for full command details.

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Errata

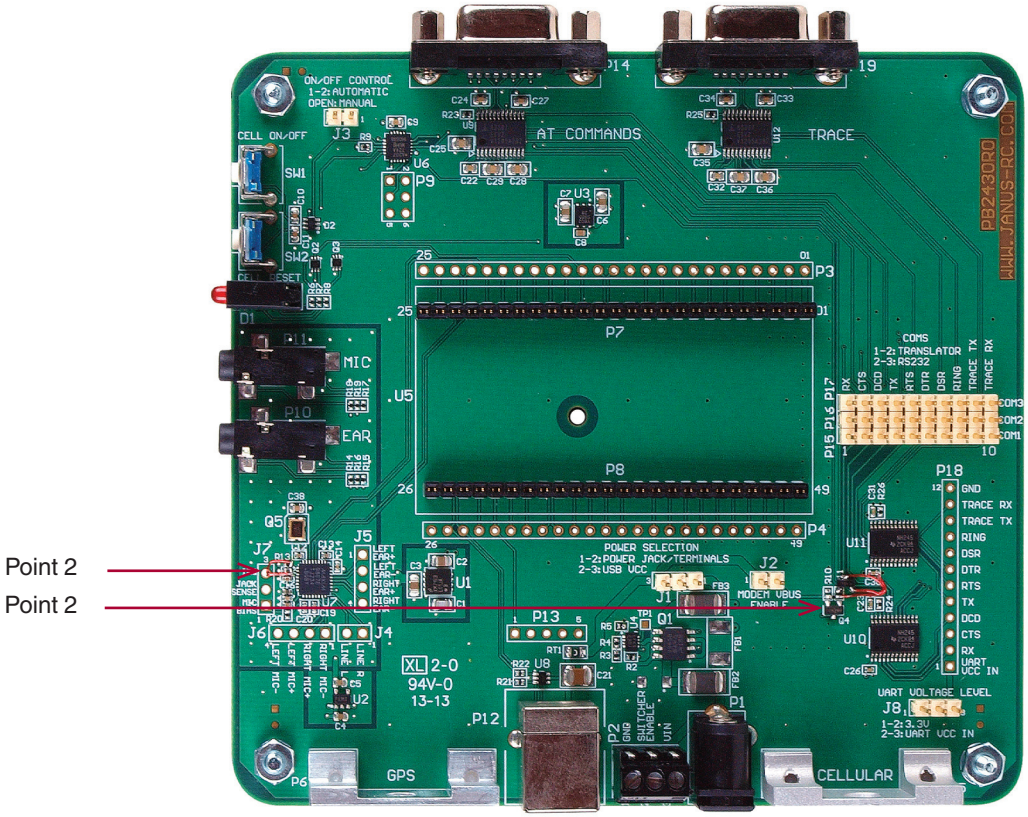
The following points are noted issues with the current build of the 910 Evaluation PCB. The board has been tested as working with these changes, but Janus Remote Communications offers no warranty.

Point 1:

I2C lines to the codec, routed manually

Point 2:

Adjustment of a FET array for proper VBUS control.



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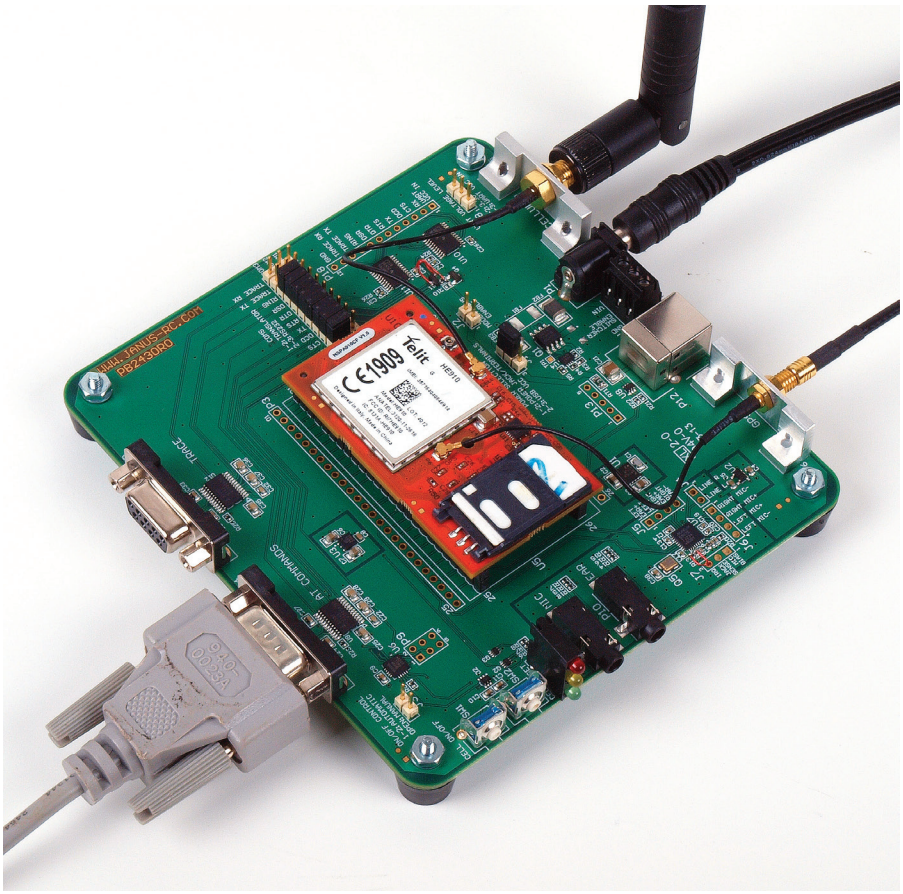

Revision	Revision Date	Note
A00	07/31/13	Preliminary Release

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